

REMARKS

By the present amendment, claims 26 and 43 have been amended. Thus, claims 18-45 remain pending in the present application. Reconsideration and allowance of pending claims 18-45 in view of the above amendments and following remarks are requested.

A. Rejection of Claims 26 and 43 under 35 USC §112, ¶ 2

The Examiner has rejected claims 26 and 43 under 35 USC §112, ¶ 2, as being indefinite. Applicant has amended claims 26 and 43 to include the word "said". Consequently, Applicant respectfully submits that the rejections under 35 USC §112, ¶ 2 should be withdrawn.

B. Rejection of Claims 18-45 under 35 USC §103(a)

The Examiner has rejected claims 18-45 under 35 USC §103(a) as being obvious with respect to alleged Applicant's "admitted prior art." For the reasons discussed below, Applicant respectfully traverses the rejection. Applicant submits that the present invention, as defined by independent claims 18, 25, and 36, is allowable.

Embodiments according to the present invention relate to independent control of polycrystalline silicon-germanium in an HBT. Independent claims 18 recites, among other things, a base comprising kinetically controlled growth mode single crystal silicon-germanium and a base contact comprising mass controlled growth mode polycrystalline

silicon-germanium. The base and base contact are both grown at a first pressure and a first temperature. Independent claims 25 and 36 contain similar limitations.

As disclosed in the present application, in a kinetically controlled growth mode, the growth rate is primarily dependent on temperature and relatively insensitive to the pressure and the precursor gas flow rate. On the other hand, in a mass controlled growth mode the growth rate is primarily dependent on the amount of precursor gas and the precursor gas pressure; the growth rate is relatively insensitive to temperature in this mode.

Referring to the present application, in one embodiment a base contact comprises mass controlled growth mode polycrystalline silicon-germanium. A base comprises kinetically controlled growth mode single crystal silicon-germanium. Consequently, at lower temperatures (e.g. 650° C), embodiments according to the present invention advantageously achieve growth of a polycrystalline silicon-germanium base contact without causing a substantial growth in the single crystal silicon-germanium base.

Moreover, for precursor gas flow rates in an appropriate range, such as between approximately 100.0 standard cubic centimeters (SCCM) and approximately 400.0 SCCM, the epitaxial growth rates for the single crystal silicon-germanium are not significantly affected, while the polycrystalline growth rates vary substantially linearly as a function of the precursor gas flow volume. Thus, the present invention achieves control over the ratio of polycrystalline silicon-germanium base contact deposition rate to single crystal silicon-germanium base deposition rate.

Consequently, control is gained over the thickness of the deposition and also the structure in terms of how much of the deposition is polycrystalline and how much is amorphous or unstructured deposition. It follows that a lower base contact resistance can be advantageously achieved by increasing the thickness of the polycrystalline silicon-germanium. Further, the crystal structure of the base is advantageously improved by increasing the proportion of polycrystalline material over amorphous.

The Examiner asserts that the present application, at pages 2-5, teaches a structure comprising a base comprising a single crystal silicon-germanium, and a base contact comprising polysilicon. Applicant respectfully submits that pages 2-5 of the present application do not disclose, teach, or suggest a base comprising kinetically controlled growth mode single crystal silicon-germanium, and a base contact comprising mass controlled growth mode polycrystalline silicon-germanium, wherein the base and base contact are grown at a first temperature and a first pressure of a precursor gas, as recited in independent claim 18. Similar limitations also appear in independent claims 25 and 36 and are not disclosed, taught, or, suggested in pages 2-5 of the present application.

Additionally, regarding dependent claims 23 and 41, the percentage of germanium is not a result-effective variable. Referring to pages 15 and 24 of the present application, an 8.0% concentration of germanium is allowed without increasing the strain between the silicon and silicon-germanium crystals beyond a critical level. A higher manufacturing yield is thus maintained since the strain does not achieve a critical level. Thus, the

percentage of germanium is a critical variable. Therefore, it would not be obvious to use an 8.0% concentration of germanium.

Furthermore, regarding dependent claims 24 and 42, the base contact resistance is not a result-effective variable. Referring to page 17 of the present application, it is important that polycrystalline base contact 121 provide a low resistance connection to base 120. Thus, the base contact resistance is a critical variable. Therefore, it would not be obvious to design a base contact resistance in accordance with values recited in dependent claims 24 and 42.

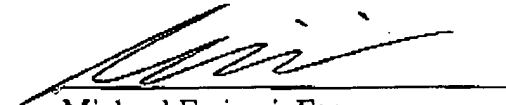
For the foregoing reasons, Applicant respectfully submits that the present invention as defined by independent claims 18, 25, and 36 is patentable. As such, the claims depending from amended independent claims 18, 25, and 36 are, *a fortiori*, also patentable for at least the reasons presented above and also for additional limitations contained in each dependent claim.

C. Conclusion

Based on the foregoing reasons, the present invention, as defined by independent claims 18, 25, and 36, and claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, outstanding claims 18-45 are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early Notice of Allowance directed to claims 18-45 pending in the present application are respectfully requested.

Respectfully Submitted,
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Date: 6/28/04


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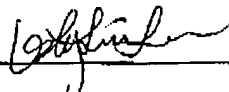
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